The Journal of Socio-Economics 38 (2009) 946–956

Contents lists available at ScienceDirect

The Journal of Socio-Economics

journal homepage: www.elsevier.com/locate/soceco

Healthy, educated and wealthy: A primer on the impact of public and private welfare expenditures on economic growth

Sergio Beraldo[a], Daniel Montolio[b], Gilberto Turati[c,*]

[a] Università degli Studi di Napoli "Federico II", Dipartimento di Scienze dello Stato, Italy
[b] Universitat de Barcelona, Dept. d'Hisenda Pública & Institut d'Economia de Barcelona, Spain
[c] Università degli Studi di Torino, Dipartimento di Scienze Economiche e Finanziarie "G. Prato", Italy

ARTICLE INFO

Article history:
Received 25 November 2008
Received in revised form 5 June 2009
Accepted 17 June 2009

JEL classification:
H51
H52
I38
O47

Keywords:
Health
Education
Public and private expenditure
Economic growth

ABSTRACT

In this paper, we provide first evidence of the impact of public and private expenditures in health and education on economic growth, via their influence on people's health, skills and knowledge. We consider a growth accounting framework in order to test whether countries that devote a larger amount of resources to the consumption of health and educational services experience higher growth rates. We also test whether the effects on economic growth of public expenditure in health and education differ from those of private expenditure. Our empirical analysis is based on a panel of 19 OECD countries observed between 1971 and 1998. The results are consistent with the hypothesis that health and education expenditure affects positively growth. The estimated impact is stronger for health than for education. More importantly, we find some evidence that public expenditure influences GDP growth more than private expenditure.

"*Niuno Stato adunque non sarà giammai nè savio, nè ricco, nè potente, se non vi sia educazione, e se l'industria e una ben animata e regolata fatica non vi somministri abbondevolmente a tutti di quelle cose che servono al bisogno, alla comodità e al piacere della vita*"

["No State then will be wise, rich, and powerful without education, and whether industry and a lively and regulated effort will not provide in abundance to everybody those things useful for need, comfort, and pleasure of life"]

(A. Genovesi, Delle Lezioni di Commercio o sia di Economia Civile, 1765–1767)

1. Introduction

Welfare State policies have been the subject of several discussions and reform proposals among scholars and politicians over the last 30 years. Political support in favour of such policies has been declining especially in Europe, where a great deal of resources is devoted to their funding. Following a standard neoclassical approach, many authors argue that reducing the *size* of the Welfare State would stimulate economic growth via the reduction in distortionary taxation. Unsurprisingly, this argument gains greater political support whenever public intervention is perceived as inefficient.[1]

However, as Atkinson (1995a,b, 1999) and Lindert (2004) suggest, the above neoclassical argument is somewhat distorted as the Welfare State makes also *productive* public expenditure available, that might have a positive effect on economic growth.[2] At least public expenditure in health and education should reasonably contribute to this end: a healthy and educated worker may be plausibly expected to be more productive than one who is uneducated and in poor health.[3]

* Corresponding author at: Università di Torino, Dipartimento di Scienze Economiche e Finanziarie "G. Prato", Corso Unione Sovietica 218 bis, 10134 Torino, Italy. Tel.: +39 011 6706046; fax: +39 011 6706062.
E-mail address: turati@econ.unito.it (G. Turati).

1053-5357/$ – see front matter © 2009 Elsevier Inc. All rights reserved.
doi:10.1016/j.socec.2009.06.013

[1] Another reason recently emphasised by the political economy literature to explain why the political climate has varied, focuses on the effects of skill biased technical change and the resulting increase in wage inequality, favouring the emergence of social preferences claiming for a downsizing of redistributive policies (e.g., Hassler et al., 2003).

[2] On the neoclassical side, Barro (1990) in his attempt of determining the "optimal size" of government (see on this Barro and Sala-I-Martin, 1995) recognizes that public expenditure might be productive, but only to the extent that it provides inputs to private production (e.g., infrastructures).

[3] As Streeten (1994) points out, "a well nourished healthy, educated, skilled, alert labour force is the most productive asset". From his perspective, societies should con-

From a theoretical standpoint, the list of arguments just mentioned in favour or against the Welfare State is not even complete. For instance, Gintis and Bowles (1982) suggest that both the "human capital" approach and the standard neoclassical argument do not take into account that the Welfare State guarantees (as a *social institution*) stable and peaceful relations between capital and labour, thus shaping an economic and social environment in which private investments are stimulated.[4]

This latter argument is clearly related with the notable impact of the Welfare State on the distribution of economic resources, hence on the effects that a fairer distribution might have on growth: on one hand, because the more the distribution is unequal, the more likely is that governments will be called to implement policies that reduce the expected gains from private investments (e.g., Perotti, 1992; Persson and Tabellini, 1994; Alesina and Rodrik, 1994); on the other hand, because shortage of resources *at the individual level* coupled with imperfections in capital markets dramatically reduces profitable investment opportunities (see, e.g., Putterman et al., 1998; Aghion et al., 1999).[5]

The discussion above makes clear that the development of the theoretical debate around the Welfare State is such as to leave an observer in a quite uncomfortable situation, since a definitive prediction about its overall effect on economic performance is unavailable. It is noteworthy that also the attempts to assess on empirical grounds this relationship are far than conclusive (e.g., Easterly and Rebelo, 1994; Devarajan et al., 1996; Kneller et al., 1999; Zagler and Dürnecker, 2003; Afonso et al., 2005). The main motivation is that the Welfare State is a wide umbrella under which lots of different policies are assembled together. Much of the answer to the question of whether the Welfare State enhances or harms growth, depends on which welfare policies are considered, how the various programs are designed and financed, and what is the degree of pervasiveness achieved by public intervention.[6]

In this paper, we focus on two particular welfare policies: health and education. Although the consumption of such goods has a theoretically clear impact on growth via its effects on people's productivity, in many western countries there are strong claims to reduce public involvement also in the delivery of such goods. However, reducing public intervention in these policy areas would probably imply a higher allocation of health and educational services by means of private markets. The effect this could have on people's health, skills and knowledge, is questionable, as substituting public with private provision might entail a *level* and a *distribution* of consumption of such goods that is sub-optimal from the social point of view. As it has been argued by Martin and Pearson (2005), "there is a suspicion that private provision will favour the rich, and this objection needs to be addressed".

By considering a growth accounting framework, in this paper we provide first evidence on the differential impact of public and private expenditures in health and education on GDP growth. The empirical analysis is based on a panel of 19 OECD countries observed from 1971 to 1998. Our results suggest that the contribution of public health and education more than offset the distortions caused by the tax system, and that the positive effect on growth is greater for health. More importantly, we find evidence that public expenditures affect GDP growth more than private expenditures. In particular, our estimates suggest that a 1% increase in total health expenditure growth rate would increase the per-capita GDP growth rate by about 0.06–0.10%, with most of this effect coming from public expenditure (0.04–0.07%); the increase in GDP growth stemming from growth in (public) expenditure on education is around 0.03%. These results seem particularly remarkable in the light of the actual academic and political debate.

The remainder of the paper is organised as follows. In Section 2, we briefly survey theoretical and empirical papers linking expenditures in health and education to economic growth. In Section 3, we describe our empirical approach and our sample, and discuss our results. Section 4 concludes the paper.

2. Linking expenditures in health and education to economic growth

2.1. The "human factor" and its measurement

The theoretical literature mentions several ways to relate *expenditure* in health and education to economic growth. Most of these links rely on the idea that a healthy and educated worker is expected to contribute more to production than one who is uneducated and in poor health. A first strand of literature focuses on *human development*, a concept introduced by Amartya Sen (e.g., Sen, 1987, 2000) and accepted by the United Nations Development Programme (1990) as a basis for the Human Development Report. This approach acknowledges that the opportunity set for healthy and educated workers is much larger than that of people who are uneducated and in poor health (Anand and Ravallion, 1993). A second interrelated strand of literature focuses on *human capital*, which is a somewhat stricter concept, since it refers only to the skills and knowledge that individuals acquire, and which can be exploited in their role of workers in the labour market.

Both these strands of literature emphasise what may be called the "human factor" contribution to economic growth, and are consistent with two approaches. The first works via a positive effect on labour productivity (the "Lucas approach"), while the other through a positive impact on the rate of innovation (the "Nelson and Phelps approach"). Both these approaches can be formalised by considering an aggregate production function with the following general form (Eq. (1)):

$$Y_t = F(K_t, L_t, A_t) \tag{1}$$

where Y is aggregate income, K is physical capital, L *broadly* represents *workers*, A is the level of technology, and t is an index for time. The "human factor" contribution to economic growth is embodied either in L or in A. In the first case (the "Lucas approach"), L is usually dubbed as "effective units" of labour; while in the second case (the "Nelson and Phelps approach"), A is split into two components,

sume health and educational services *regardless of their effect on economic growth*: "... it is odd that Hondas, beer, and television sets are often accepted without questioning as final consumption goods, while nutrition, education, and health services have to be justified on grounds of productivity... The World Bank's 1993 Development Report on health has the sub-title "Investing in Health" as if good health had to show economic returns higher than the cost of capital. What if the returns to investment in health are zero?".

[4] As Gintis and Bowles (1982) point out, "the alternative to the Welfare State is ... not simply less redistribution, but includes possible institutional transformation. The possible patterns of economic evolution consistent with the no-welfare-state option ... include chaos, stagnation, and the development of new and perhaps unprecedented economic systems".

[5] It is plausible to believe, however, that over a certain threshold the theoretical arguments supporting the existence of a positive relationship between a less dispersed distribution of income and economic growth are not applicable. When the public intervention becomes excessively pervasive, "many individuals are then likely to start regarding the distribution of income as *arbitrarily* determined in the political process, rather than as fulfilling important functions for the allocation of resources and economic efficiency ... As a result, distributional conflicts may in fact, after a point, be accentuated by reduced income differentials" (Lindbeck, 1997).

[6] These considerations also suggest the relevance of *policy design* in explaining the aggregate effect of the Welfare State: welfare policies should be consistent with individual incentives to supply capital and labour; furthermore, they should not open the door to social stigma for welfare recipients. On the importance of policy design, see Barr (1992).

one of which is related to "pure technical change" and the other to "labour induced technical change".[7]

The crucial problem faced by the empirical literature on the subject is clearly how to get to a reliable measure of the "human factor". As the choice of the proxy measure is severely constrained by data availability, it is not surprising that the variables used both in the human development and the human capital approaches, are to a large extent similar. Within the *human development* approach, for instance, the Human Development Report (1990) combines three variables (life expectancy, adult literacy, and command over resources needed for a decent living) to construct a "Human Development Index". The proxies used to account for the "human factor" within the *human capital* approach are basically the same (Bloom et al., 2004; Herbertsson, 2003; Knowles and Owen, 1997; Mankiw et al., 1992; Webber, 2002). In their surveys on the most commonly used proxies for the "human factor", Le et al. (2003) and Wößmann (2003) identify three broad approaches: a cost-based approach; an income-based approach; and an educational stock-based approach. The cost-based approach basically proxies the "human factor" by considering both the costs of producing the physical human being (i.e., the costs of rearing a child) and the costs of increasing labour productivity (e.g., expenditures in health and education). The income-based approach measures human capital by considering the total income that could be generated by an individual during her lifetime. Finally, the educational stock-based approach focuses on the educational attainment of the labour force (i.e., the average years of schooling or the adult literacy rates). Since we are interested in assessing the contribution of welfare expenditures to economic growth, we work here with a cost-based approach; this choice will be further discussed in Section 3.

2.2. Public and private welfare expenditures: are they different?

Previous contributions generally considered public expenditure in isolation, or considered either expenditure on health or education. Unlike these approaches, we consider *both* public and private expenditure. To the best of our knowledge, this point has never been raised before. Table 1 shows – for the OECD countries considered in this paper – the level of public and private welfare expenditure as a percentage of GDP at the end of the Nineties. There are three stylised facts worth mentioning. First, for both health and education, public expenditure is higher than the private one as a share of GDP in almost all countries (a notable exception being the US). Second, all the countries considered here devote a larger amount of public resources to health. Third, the sample shows a wide variability in the share of GDP devoted to health and education (larger for the private component).

One point that deserves attention is why public and private expenditure on health and education might differently affect economic growth. According to the existing literature, at least four different reasons can be identified. The first two are related to the traditional externality argument and to the effect of public provision on the social environment. As for the latter, a typical example is public schooling: a common cultural background provided to students improves social cohesion.[8] The third reason rests on the answer given to the question of whether private and public expenditures should be considered substitutes or complements at the individual level. In the former case, public provision may simply affect out of pocket expenses. In the latter case, private purchases can be thought as topping up public provision, therefore being less productive if diminishing marginal returns to health and education are assumed. A fourth reason of the possible differential impact of public and private welfare expenditures directly question the (often implicit) assumption that whenever personal gains can be obtained by investing in health or education, individuals will undertake the required actions, by relying either on their own resources, or by borrowing the necessary funds from the capital markets; a story that seems far from being true in second-best environments. In such circumstances some individuals will in fact invest "too much", while some others will not be able to afford the cost of the investment, since market imperfections raise interest rates to prohibitive levels (Hoff and Lyon, 1995). The presence of market imperfections might make redistributive policies growth enhancing, as those individuals who are credit constrained are the same who exhibit higher marginal returns from their investment in health or education (Aghion et al., 1999; Deaton, 2003). It is clear that the Welfare State – by directly providing the individuals with health and educational services – may work as an institutional device aimed at solving these market imperfections, allowing individuals with positive expected returns to undertake investments in human capital.

Exploiting this argument, one can hypothesize what could be expected from a policy aimed at reducing public funding on health and educational services. Individuals would presumably react by increasing the amount of services obtained through private markets and financed out-of-pocket. In the presence of credit constraints, this would reduce the potential (aggregate) stock of human capital, and increase the *variance* of human capital endowments, in terms of acquired skills and/or health status. In turn, this will exacerbate the *ex-ante* income inequality, and will negatively influence economic growth. This view is consistent with a growing body of literature focusing both on education and health (e.g., Decker and Remler, 2004; Goodspeed, 2000; Jappelli et al., 2007). The view that credit constraints play a crucial role is directly tested by, e.g., Carneiro and Heckman (2003), Dearden et al. (2004), and Aakvik et al. (2005) for educational attainments, and by Baldini and Turati (2006) for the access to private health care services. All these studies largely confirm that credit constraints matter, even if the estimated impact of these (short-term) constraints seem to be less important than the effect of family background and other long-run constraints.[9] There are then plausible reasons to expect that – at the aggregate level – public expenditure on health and education is more productive than private expenditure. In this paper, we propose a first step to directly test this prediction.

3. The empirical analysis: a primer

In this section, we describe our empirical methodology, grounded on a cost-based approach to the measurement of the "human factor" contribution to economic growth. The key point is that we model the "human factor" as a function of *total* (i.e., public and private) expenditure on health and education. In other words, the "human factor" stems from the *consumption* of educational and health services; but while the consumption of health services

[7] Besides these first-order effects, health and education expenditures may also have second-order effects. For instance, it is widely agreed that the provision of welfare services, by increasing longevity, thus changing the age structure of the population, may affect economic growth (e.g. Boucekkine et al., 2002; Chakraborty, 2004).

[8] See for instance Gradstein and Justman (2000). Notice that this argument is to some extent related to the concept of "social capital", which has recently received considerable attention in the literature on the determinants of growth (e.g. Knack and Keefer, 1997; Durlauf, 2002, for a critical discussion).

[9] Notice that this latter observation, rather than diminishing the importance of relying on public intervention to ameliorate the accumulation of human capital, puts forward the right question to be addressed in order to design a growth-enhancing public policy, working via the reduction of inequalities. Further research is needed to adequately address this issue. However, we suspect that properly designed public intervention is the only means available to cope with observed inequalities in human capital accumulation, arising both from income and socio-economic inequalities.

Table 1
Share of GDP devoted to public and private health and education expenditure (1999, %).

	Public health expenditure	Private health expenditure	Public education expenditure	Private education expenditure
Australia	5.7	2.4	4.5	1.4
Austria	6.3	2.7	6.0	0.3
Canada	6.6	2.7	5.3	1.3
Denmark	7.5	1.6	6.4	0.3
Finland	5.4	1.8	5.7	0.1
Germany	8.4	2.7	4.3	1.2
Ireland	5.6	1.7	4.1	0.4
Italy	6.3	2.4	4.4	0.4
Japan	5.9	1.7	3.5	1.1
Luxembourg	5.9	0.4	4.2	–
Netherlands	6.1	3.1	4.3	0.4
New Zealand	6.4	1.9	5.9	–
Norway	7.6	1.6	6.5	0.1
Portugal	6.4	2.7	5.6	0.1
Spain	5.9	2.5	4.4	0.9
Sweden	6.4	1.2	6.5	0.2
UK	6.2	1.5	4.4	0.7
US	6.0	7.6	4.9	1.6
Mean	6.4	2.3	5.1	0.7
Standard deviation	0.8	1.5	0.9	0.5

Source: Own elaborations from OECD. *Note*: All data are for the year 1999 except for public education expenditure in Luxembourg which refers to the year 1997.

can only recover health status in the case of an adverse health shock (or maintain it with preventive care; see, e.g., Grossman, 1972), the stock of knowledge can be augmented ideally throughout the entire lifetime by consuming educational services. That is why we assume that only "*current*" consumption of health services influences health status, whereas "*current*" and "*past*" consumption of educational services influence the amount of knowledge.

It is noteworthy that – as all the others – also our cost-based measure of the "human factor" is subject to criticism, for the simple reason that expenditure in education might not be consistently linked to acquired cognitive skill (e.g., Hanushek, 1996; Le et al., 2003). To answer this criticism, we first note that all the common proxies of the *human factor* are imperfect, and (more importantly) constrained by data availability (Wößmann, 2003). Furthermore, our choice is supported by a growing body of empirical evidence claiming that a causal relationship exists between expenditures on health care (education) and health status (education attainment) (e.g., Gupta et al., 2002), which is found to increase with the quality of governance (Rajkumar and Swaroop, 2002). This may raise the doubt that the correlations between most of the commonly used measures of human capital or human development (e.g., adult literacy, life expectancy, school enrolment ratios) and output growth are only indirect; these variables may indeed be correlated with expenditures in health or education, and expenditures may have a genuine causal relationship with growth.

3.1. Methodology

In terms of empirical strategies, there are at least two different methodologies for estimating the contribution of the "human factor" to economic growth. The first is based on an economic model of growth, which takes exogenously given growth rates of the labour force and technology. This methodology provides an equation which links the aggregate product to the steady state values of the growth determinants (e.g., Mankiw et al., 1992). The second strategy is based on a growth accounting framework that – by assuming that the production factors are paid their marginal productivity – considers the GDP growth rate as a function of the inputs' growth rates and output shares (e.g., Barro, 1999). Within this latter strategy, it is possible to distinguish two further methods for estimating the contribution of the "human factor". The first is the traditional method based on the *observed* factor shares; the second is based on regression analysis, where the factor shares represent the coefficients to be estimated.

We consider here a growth accounting framework. For our purposes, by differentiating Eq. (1) with respect to time, dividing by Y and assuming each input is paid its marginal product, we obtain:

$$\frac{\Delta Y}{Y} = s_K\frac{\Delta K}{K} + s_L\frac{\Delta L}{L} + s_A\frac{\Delta A}{A}. \qquad (2)$$

where s_i ($i = K, L, A$) represents the share of each input in national income (Besley, 2001). In practice, s_A is not observable, and therefore we cannot *directly* measure the contribution of technology to output, because it cannot be separated from the contributions of physical capital and (broadly defined) labour. The reason for this is that the *observed* factor shares of physical capital (σ_K) and labour (σ_L) also include the remuneration of technology, and the contribution of the "human factor" to economic growth (on this point, see again Besley, 2001). Following this rationale, we can rewrite the decomposition of output – assuming constant returns to scale at the aggregate level – as:

$$\frac{\Delta Y}{Y} = \sigma_K\frac{\Delta K}{K} + \sigma_L\frac{\Delta L}{L} + \frac{\Delta A}{A}, \qquad (3)$$

where $\sigma_K + \sigma_L = 1$ and $\Delta A/A$ is usually identified as Total Factor Productivity or the Solow residual (e.g., Barro, 1999).

To define the link between the "human factor" and output growth rate, let us first follow the "Lucas approach" and assume that expenditures in health and education contribute to define effective units of labour L^* as follows:

$$L_t^* = f(L_t, E_t^{pu}, E_{t-1}^{pu}, E_{t-2}^{pu}, \ldots, HE_t^{pu}, E_t^{pr}, E_{t-1}^{pr}, E_{t-2}^{pr}, \ldots, HE_t^{pr}; I), \qquad (4a)$$

where L is the number of workers, HE and E are expenditures in health and in education, respectively, pu and pr are mnemonics for public and private, and I represents the institutional features which may be relevant to explain differences in the *quality* of these two types of expenditures (e.g., whether such goods are provided at the central or at the local level, whether there is any competition between public and private suppliers, or whether availability of badly designed public provision distorts individual incentives). Considering the definition of effective units of labour given in Eq. (4a), and substituting in Eq. (3), the equation to be estimated can be written as

$$\Delta \ln Y_{it} = \beta_1 \Delta \ln K_{it} + \beta_2 \Delta \ln L_{it} + \beta_3 \Delta \ln (HE^{pu})_{it} + \beta_4 \Delta \ln (HE^{pr})_{it} + + \beta_5 \Delta \ln (E^{pu})_{it} + \beta_6 \Delta \ln (E^{pr})_{it} + \beta_7 \Delta \ln (E^{pu})_{it-1} + \beta_8 \Delta \ln (E^{pr})_{it-1} + \ldots + \lambda_i + \phi_t + \varepsilon_{it} \quad (5)$$

where λ_i and ϕ_t are country and time fixed effects, respectively, and ε_{it} represents a standard error term. The time effect ϕ_t includes all those influences on the output growth rate common to all countries in a given year (e.g., the economic cycle), while the individual effect λ_i picks up the influences specific to each country (e.g., social, religious, climate or geographical factors, but also the differences in the level and the composition of welfare expenditures). λ_i and ϕ_t provide also a control for the institutional differences outlined above.

An alternative way of getting to Eq. (5) follows the "Nelson and Phelps approach", and models the "human factor" using the efficiency parameter *A*. In particular, we assume that the efficiency parameter is a function of the technology *TE* and the labour productivity *LP*; hence:

$$A_t = f(TE_t, LP_t) = f(TE_t, E_t^{pu}, E_{t-1}^{pu}, E_{t-2}^{pu}, \ldots, HE_t^{pr}, E_t^{pr}, E_{t-1}^{pr}, E_{t-2}^{pr}, \ldots, HE_t^{pr}; I). \quad (4b)$$

In other words, as before, labour productivity stems from the *consumption* of (current) health and (current and past) educational services. Substituting Eq. (4b) in Eq. (3), we are then back again to Eq. (5).

As Temple (1999) has pointed out, there are several problems in estimating and interpreting growth regressions as Eq. (5): from parameter heterogeneity to the presence of possible outliers in the data; from model uncertainty to endogeneity and measurement errors; from spatial correlation to (possibly) reverse causality. These problems notwithstanding, the usefulness of this style of research should not be dismissed, and – as Temple suggests – suitable solutions can in many cases be identified. For instance, "techniques that make more use of time series variation in the data might yet overcome many of the objections often raised to cross-country research". Several advantages are offered by panel data techniques, such as the possibility of controlling for omitted variables persistent over time, or the use of lags of regressors as instruments. In the following analysis, we use these techniques to estimate Eq. (5), and check the robustness of our results by considering additional suggestions by Temple (1999). Costs and benefits of our methodology are discussed in the next sections.

3.2. Data

In order to empirically estimate Eq. (5), we use at first annual data on a per-capita basis from a sample of 19 OECD countries during the period 1971–1998, yielding a panel with $N = 19$ and $T = 28$ at best.[10] Definitions, descriptive statistics, and data sources for all the variables included in our empirical analysis are reported in Appendix 1. Data on macroeconomic variables come from the Penn World Tables 6.1, and include data on population, real GDP per capita at constant prices[11] (*Y*), and the investment share of GDP; the labour force (*L*) in each country was obtained from OECD Health Data. We have constructed a measure of private capital stock (*K*) for each country using a perpetual inventory method. Following Bloom et al. (2004), we start the capital stock series setting the capital stock in the initial year equal to the average investment/GDP ratio in the first 5 years of data, multiplied by the level of GDP in the initialising year and divided by 0.07 (our assumed depreciation rate). The capital stock of each subsequent period is calculated using current capital, plus the level of current investment, minus the 7% depreciation rate of the current stock.

As for welfare expenditures, health expenditure (*HE*) is measured by using data on public and private spending on health per capita, expressed in international PPP dollars from the OECD Health Data. Similarly, we measure education expenditure (*E*) using data on public and private spending on education per capita. However, data on education spending are difficult to obtain for a long time span; as a result, we will be forced to consider only *current* expenditure in education in the following empirical analysis. In order to partially overcome this problem, and check the robustness of our results, we use two data sources for public expenditure in education (from the UNESCO and the World Bank databases). Finally, the data on private spending in education (covering all levels) are from OECD *Education at a Glance*.

We also include additional controls for institutional aspects that might influence the "quality" of spending in different countries. For instance, Tabellini (2005) suggests that public expenditure can be productive or not, according to the ability of politicians to extract rents, which ultimately hinges upon the institutional features shaping their incentives. Data on income inequality as measured by the Gini index (*GINI*) come from Deininger and Squire (1996). Political variables are taken from DPI2000 (Keefer, 2002), and include: a dummy variable equal to one whenever Central Government is supported by left-wing parties (*EXECRLC*), a variable measuring the fraction of seats held by the Government (*MAJ*), and a dummy variable equal to one in the years of legislative elections (*LEGELEC*). Data on the degree of fiscal decentralisation, proxied by the percentage of taxes collected by the Central Government (*CGTAX*), are obtained from the OECD *Revenue Statistics 1965–2002*.

One issue that needs to be tackled in discussing data, concerns whether it is best to use annual data, or 5- or 10-years averages to avoid business cycles effects. The question remains largely unsettled (e.g., Temple, 1999). Therefore, we consider at first annual data, and then use 5-years averages as an additional robustness test.

3.3. Results

In this section, we present the main results of our empirical analysis, which represents a first attempt to identify the differential effect of public and private welfare expenditures. The key problem is the lack of data for private expenditure on education, which shortens the time span and reduces the sample of countries, making it difficult to identify the parameters of interest.[12] We therefore start by considering only public and private expenditure on health. We then augment our basic estimation by adding public expenditure on education and, finally, by including private expenditure. As an additional experiment, we also consider a regression with expenditure in education only.

Table 2 shows our estimates when expenditure in health is considered in isolation. The Breusch–Pagan test and the Hausman (1978) test indicate that the 2-way REM is the preferred model. As expected, most of the coefficients are positive and statistically significant at the usual confidence levels. The coefficient associated with physical capital is significantly greater than that associated

[10] Due to data availability, especially for the data about expenditure in education, we have selected a sample of OECD countries for which we were able to obtain annual series of the variables used in this work. The countries included are: Australia, Austria, Canada, Denmark, Finland, Germany, Ireland, Italy, Japan, Luxembourg, Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, UK, and US.

[11] Constant price values of GDP are calculated using a Laspeyres index.

[12] See the table notes for the definition of the sample of countries and the time span used in each group of estimations.

Table 2
Production function in growth form. Health spending (public and private). Dependent variable: annual growth rate of GDP; 2-way REM using GLS.

Variables	(I)	(II)	(III)	(IV)
Constant	0.0085 (2.517)**	0.0092 (2.740)***	0.0102 (3.217)***	0.0118 (3.982)***
Capital	0.7696 (9.194)***	0.7787 (9.234)***	0.7807 (9.370)***	0.8066 (9.282)***
Labour	0.1436 (2.688)***	0.1391 (2.585)***	0.1384 (2.589)**	0.1421 (2.646)***
HE^{tot}	0.0574 (2.208)**	–	–	–
HE^{pu}	–	0.0392 (1.749)*	0.0327 (1.480)	–
HE^{pr}	–	0.0078 (1.164)	–	0.0074 (1.104)
N (*par*)	365 (4)	365 (5)	369 (4)	371 (4)
R^2	28.12	28.17	27.96	27.87
B-P (*LM*)	110.21***	108.93***	100.84***	114.83***
Hausman	3.55 [0.3140]	2.93 [0.5696]	3.17 [0.3659]	0.74 [0.8646]

Notes: *t*-Values in parenthesis and *p*-values in brackets. Estimations performed with individual and time random effects (2-way REM model). Results obtained using White robust standard errors. Sample of OECD countries used (18): Australia, Austria, Canada, Denmark, Finland, Germany, Ireland, Italy, Japan, Luxembourg, Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, UK and US (the number of observations, *N*, differs because some series are unbalanced). Time span: 1971–1998. High values of the Breusch–Pagan (LM) test favour FEM/REM over the Pooled Estimator (OLS). High (low) values of the Hausman test favour FEM (REM).

* Indicates significance at 10% level.

** Indicates significance at 5% level.

*** Indicates significance at 1% level.

Table 3
Production function in growth form. Health spending (public and private) and education spending (public). Dependent variable: annual growth rate of GDP; 2-way FEM using LSDV.

Variables	(I)	(II)	(III)	(IV)	(V)
Constant	0.0055 (1.754)*	0.0075 (2.551)**	0.0049 (1.321)	0.0055 (1.621)	0.0072 (2.462)**
Capital	0.8599 (6.533)***	0.8719 (6.609)***	0.8146 (6.194)***	0.8188 (6.247)***	0.8318 (6.373)***
Labour	0.0693 (0.765)	0.0467 (0.511)	0.0726 (0.796)	0.0505 (0.551)	0.0425 (0.465)
HE^{tot}	0.0832 (2.665)***	–	0.0938 (2.327)**	–	–
HE^{pu}	–	0.0592 (2.128)**	–	0.0772 (2.625)***	0.0679 (2.422)**
HE^{pr}	–	0.0018 (1.895)*	–	0.0125 (1.045)	–
E^{pub}(WB)	–	–	0.0299 (2.248)**	0.0293 (2.207)**	0.0292 (2.193)**
N (*par*)	240 (34)	240 (35)	220 (35)	220 (36)	220 (35)
R^2	52.07	52.06	57.10	57.45	57.20
B-P (*LM*)	87.21***	83.77***	95.72***	98.48***	99.53***
Hausman	11.35 [0.0099]	10.68 [0.0303]	10.15 [0.0379]	16.13 [0.0064]	12.36 [0.0148]

Notes: *t*-Values in parenthesis and *p*-values in brackets. Estimations performed with individual and time dummies (2-way FEM model). Results obtained using White robust standard errors. Sample of OECD countries used (16): Australia, Austria, Canada, Denmark, Finland, Ireland, Luxembourg, Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, UK and US (the number of observations, *N*, differ because some series are unbalanced). Time span: 1980–1995. High values of the Breusch–Pagan (LM) test favour FEM/REM over the Pooled Estimator (OLS). High (low) values of the Hausman test favour FEM (REM). We performed the same estimations using data on public spending in education from UNESCO. The main results (not reported but available upon request) are broadly in line with those presented here. The estimated coefficient for public spending on education is around 0.02–0.03 in all the models.

* Indicates significance at 10% level.

** Indicates significance at 5% level.

*** Indicates significance at 1% level.

with labour. This result holds for all our models, and is at odds with findings, e.g., by Bloom et al. (2004).[13] Coming to the variables which constitute the main focus of the paper, the estimated coefficient for *total* health expenditure is 0.0574 (column I)[14]: a 1% increase in the HE^{tot} growth rate would increase the per-capita GDP growth rate by about 0.06%. In column II, we test whether the coefficients associated with public and private expenditures differ. Results show that the coefficients for the two types of expenditure do have a different magnitude, with the coefficient associated with public expenditure greater than that of private expenditure and statistically significant. In particular, a 1% increase in HE^{pu} growth rate will result in a 0.04% increase in the per-capita GDP growth rate, while a 1% increase in HE^{pr} growth rate will increase the per-capita GDP growth rate by less than 0.01%. Regressions in columns III and IV suggest that these two coefficients are robust and well identified. These results confirm theoretical beliefs on public welfare expenditure being more productive than private.[15]

Table 3 reports our estimates when augmenting the first set of regressions by also considering public expenditure in education. The Breusch–Pagan test and the Hausman test now indicate that the 2-way FEM is the preferred model. While the coefficient for physical capital remains unaltered, the one for labour is now reduced and becomes statistically insignificant. However, results show an increase in the magnitude of the coefficients on public and private expenditure in health, with both coefficients appearing now statistically significant. The coefficient for public expenditure in education also shows the expected sign and is statistically significant. According to these results, public expenditure in health seems to have a greater impact on economic growth than public expenditure on education. The results are robust for the two variables of public spending on education used (UNESCO and World Bank): a 1% increase in E^{pu} growth rate will result approximately in

13 Indeed, coefficient on *K* is greater than that normally found in the literature on growth, probably suggesting an endogeneity problem. We will partially address this issue below, by considering 5-years averages of the relevant variables.

14 Notice that the coefficients on welfare expenditures pick up both the first and the second order effects of these variables on growth, i.e. both the direct impact on the "human factor" and the indirect impact that the "human factor" may have on other variables such as *K* (as discussed in Section 2.1 above).

15 It is worth noting that, as pointed out by Kneller et al. (1999), our estimates of the effects of public spending on GDP growth should suffer from a *downward bias* caused by the omission of distortionary taxation. For this reason, our conclusions on the positive impact of public expenditure should then be reinforced.

Table 4
Production function in growth form. Health spending (public and private). Dependent variable: 5-years average growth rate of GDP; 2-way REM using GLS.

Variables	(I)	(II)	(III)	(IV)
Constant	0.0058 (0.686)	0.0077 (0.910)	0.0058 (0.736)	0.0168 (2.194)**
Capital	0.4720 (3.533)***	0.4459 (3.244)***	0.4448 (3.378)***	0.5747 (4.616)***
Labour	0.2896 (2.105)**	0.2928 (2.106)**	0.2910 (2.158)**	0.2723 (1.971)**
HE^{tot}	0.1311 (1.694)*	–	–	–
HE^{pu}	–	0.1365 (2.070)**	0.1389 (2.153)**	–
HE^{pr}	–	−0.0199 (−0.659)	–	−0.0263 (−0.849)
N (*par*)	70(4)	70(5)	70(4)	70(4)
R^2	36.63	37.78	36.06	37.92
B-P (*LM*)	27.96***	28.52***	36.39***	41.62***
Hausman	2.88 [0.4104]	3.62 [0.4605]	3.81 [0.2828]	1.56 [0.6687]

Notes: *t*-values in parenthesis and *p*-values in brackets. Estimations performed with individual and time random effects (2-way REM model). Results obtained using White robust standard errors. Sample of OECD countries used (18): Australia, Austria, Canada, Denmark, Finland, Germany, Ireland, Italy, Japan, Luxembourg, Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, UK and US (the number of observations, *N*, differs because some series are unbalanced). High values of the Breusch–Pagan (LM) test favour FEM/REM over the Pooled Estimator (OLS). High (low) values of the Hausman test favour FEM (REM).

* Indicates significance at 10% level.

** Indicates significance at 5% level.

*** Indicates significance at 1% level.

Table 5
Production function in growth form. Health spending (public and private) and institutional variables. Dependent variable: annual growth rate of GDP; 2-way REM using GLS.

Variables	(I)	(II)	(III)	(IV)
Constant	0.0069 (0.566)	0.0099 (0.761)	0.0090 (0.711)	0.0088 (0.701)
Capital	0.7749 (8.933)***	0.7848 (8.952)***	0.7870 (9.81)***	0.8141 (9.524)***
Labour	0.1422 (2.648)***	0.1378 (2.544)**	0.1364 (2.536)**	0.1399 (2.590)***
HE^{tot}	0.0607 (2.309)**	–	–	–
HE^{pu}	–	0.04254 (1.876)*	0.0357 (1.589)	–
HE^{pr}	–	0.0082 (1.220)	–	0.0076 (1.128)
GINI	−0.0003 (−1.016)	−0.0003 (−0.971)	−0.0003 (−0.985)	−0.0001 (−0.325)
EXECRLC	−0.0003 (−0.159)	−0.0004 (−0.182)	−0.0002 (−0.092)	−0.0000 (−0.034)
MAJ	0.0100 (0.895)	0.0096 (0.846)	0.0095 (0.852)	0.0096 (0.858)
LEGEL	−0.0025 (−1.163)	−0.0026 (−1.186)	−0.0021 (−0.986)	−0.0022 (−1.021)
CGTAX	0.0121 (1.395)	0.0120 (1.323)	0.0115 (1.297)	0.0122 (1.372)
N (*par*)	364(9)	364(9)	368(9)	370(9)
R^2	29.35	29.41	29.13	29.05
B-P (*LM*)	116.54***	115.78***	105.99***	119.5524***
Hausman	6.90 [0.5479]	5.86 [0.7541]	6.75 [0.5638]	4.28 [0.8306]

Notes: See Table 1.

a 0.03% increase in the per-capita GDP growth rate. Although the larger impact of health expenditure is in line with the findings by Knowles and Owen (1997), it is worth mentioning that this result might be due to our empirical modelling strategy, that neglects past expenditures in education and the share of GDP devoted to such expenditure (which is captured, in our model, by country fixed effects). As already mentioned, this choice is mainly driven by lack of data, but also by the lack of a reliable strategy to measure the stock of human capital based on (past and current) expenditure in education.

We obtain much less stable results when augmenting previous regressions further, by adding private expenditure in education. Almost identical problems of identification show up when expenditure in education (both public and private) is considered in isolation. These two sets of results are not reported here for brevity, but they are available in the working paper version of this work (Beraldo et al., 2005). Our explanation for these findings relies on the fact that – by considering private expenditure in education – the final sample becomes rather small (about 60 observations), with only $N=9$ countries included and a very short time span ($T=9$ years); this makes parameter identification rather difficult.

3.4. Robustness checks

Previous findings support the hypothesis that public expenditure is more productive than the private one. In particular, these results are consistent with the idea that the Welfare State is not necessarily an obstacle for economic growth, as discussed in previous sections of the paper. In order to check the robustness of our findings, we run additional tests, tackling issues related to business cycles effects, institutional settings, endogeneity and reverse causality. Given the difficulties in identifying the parameters of interest when education expenditures are considered, because of the small sample, we limit robustness checks to regressions including expenditures in health only.

As for business cycles effects, we re-run regressions in Table 2 by considering 5-years averages of all the variables. All the main results are confirmed (Table 4). Coefficient for capital halves, while coefficient for labour almost doubles; both coefficients are statistically significant.[16] We observe a strong increase in the coefficient associated with HE^{tot}, from 0.05 to 0.13. This means that, following a 1% increase in HE^{tot}, per-capita GDP growth rate would now increase by 0.13%. Over a 5-years period, a 5% increase in HE^{tot} would result in more than half point of growth in GDP per capita. More importantly, by considering separately public and private expenditures, only the coefficient on public expenditure is positive and statistically significant, with a magnitude close to that of the coefficient on HE^{tot}. Hence, all the additional growth would stem from public expenditure.

[16] A possible explanation is that – by considering 5 years averages – the problem of endogeneity for *K* is partially controlled for. As this is not the main focus of the paper, we will not consider this issue further here.

We provide a further robustness test for our findings, by adding specific additional controls to regressions in Table 2, to account for different institutional features that could have not been adequately captured by fixed effects. The reasons for considering these additional variables is easily explained. One of the possible shortcomings of public spending, is that it can be productive or not, depending on the political goals of governments. The effectiveness of public expenditure is expected to be higher, the lower the rents for politicians (e.g., Tabellini, 2005). Of course, the possibility for politicians to extract rents depends on the institutional structure, that shapes their incentives. For instance, according to theories on fiscal federalism, *CGTAX* can be interpreted as a proxy for the accountability of politicians: the lower the amount of taxes collected at the central level, the higher the ability of citizens to reward good policies, as the management of resources occur at a lower level of government, and control of politicians is easier. *LEGELEC* accounts for the stability of government coalitions: the more the government coalition is unstable, the higher are the incentives to use public expenditure for obtaining and preserving rents. The results for these augmented models are shown in Table 5. Again, the main findings are confirmed—the coefficient for *total* health expenditure is now 0.0607, i.e., very close to that previously estimated, and disaggregating public and private expenditure yields coefficients of approximately the same magnitude as before. All of the coefficients for the political variables are statistically insignificant; only the coefficient for *CGTAX* appears as only marginally insignificant at the usual levels. The same test has been conducted for regressions in Tables 3 and 4, generating the same conclusions.[17] The fact that coefficients associated with institutional variables are statistically insignificant is probably due to the fact that fixed effects absorb all their explanatory power, since these variables show only small variability across time. Notice that according to this interpretation, there is some evidence that differences across countries in the quality of public spending *matter*, but their effects are captured by fixed effects only. Our findings about the greater productivity of public spending are still confirmed.

A third robustness check relates to the problems of endogeneity and reverse causality of our welfare expenditure variables. A well documented stylised fact is that (total) expenditure in health and education rises with per-capita GDP. Empirical papers trying to address the direction of causality between the Welfare State and economic growth (e.g., Herce et al., 2001) found inconclusive evidence. We do not address *directly* this issue here, and concentrate instead on endogeneity. In order to cope with this problem, we consider the IV estimation of our previous model, using the GMM estimator. Table 6 shows the GMM estimates. To control for fixed effects, the variables are transformed in terms of orthogonal deviations, and a full set of time dummies is included in the regression to account for factors varying over time but which are common to all units. We report results based on consistent one-step estimators, as proposed by Arellano and Bond (1991). We use the lagged values ($t-1$ up to $t-3$) of the health expenditure variables as instruments. It is worth noting that, by considering as instruments lagged variables, we are *indirectly* addressing also the reverse causality issue. We also include the Gini index as an additional instrument in the dynamic IV estimations, checking for the validity of instruments using the Sargan test. Given that the GMM estimator uses lagged values of the variables as instruments, under the hypothesis of no autocorrelation in the error term, the series of transformed residuals should present a significant first-order correlation, while indication of second-order serial correlation should not be present. We provide two statistics, m_1 and m_2, that test

Table 6
Instrumental variables: health spending. Dependent variable: *growth rate GDP*. One-step GMM estimation.

Variables	Static IV estimation				Dynamic IV estimation			
Constant	0.0008 (0.193)	0.0019 (0.466)	0.0061 (1.53)	0.0015 (0.399)	0.0073 (1.78)*	0.0039 (1.08)	0.0270 (5.45)***	0.0062 (1.53)
g-GDP (−1)	–	–	–	–	0.0652 (0.311)	−0.1048 (−0.563)	−0.0190 (−0.111)	−0.0201 (−0.138)
Capital	0.7829 (2.37)**	0.6882 (2.02)**	0.9755 (3.46)***	0.8063 (3.78)***	0.7984 (1.86)*	0.7582 (2.05)**	0.7185 (3.99)***	0.8172 (3.10)***
Labour	0.1071 (0.836)	0.2114 (1.31)	0.2852 (3.51)***	0.2015 (3.10)***	0.1087 (0.927)	0.2504 (1.55)	0.2119 (1.93)*	0.2195 (3.31)***
HE^{tot}	0.1042 (6.13)***	–	–	–	0.0983 (5.91)***	–	–	–
$HE^{tot}(-1)$	–	–	–	–	−0.0600 (−1.71)*	–	–	–
HE^{pu}	–	0.0697 (4.15)***	–	0.0720 (4.42)***	–	0.0718 (3.58)***	–	0.0707 (3.85)***
$HE^{pu}(-1)$	–	–	–	–	–	0.0116 (0.300)	–	−0.0084 (−0.208)
HE^{pr}	–	–	0.0081 (1.92)*	0.0095 (2.91)***	–	–	0.0080 (0.857)	0.0144 (1.99)**
$HE^{pr}(-1)$	–	–	–	–	–	–	−0.0136 (−1.39)	−0.0063 (−0.803)
N (par)	347 (23)	351 (23)	353 (23)	347 (24)	328 (24)	332 (24)	352 (25)	328 (26)
RSS	0.11359	0.11493	0.1201	0.11400	0.10840	0.11328	0.12063	0.10989
Sargan (df)	61.01 (54) [0.239]	58.02 (54) [0.329]	55.39 (54) [0.422]	121.6 (110) [0.212]	58.20 (51) [0.228]	53.86 (51) [0.365]	44.55 (71) [0.994]	113.8 (105) [0.263]
m_1	−2.238**	−2.399**	−2.428**	−2.329**	−2.282**	−2.006**	−2.332**	−2.898***
m_2	−0.266	−0.075	−0.222	−0.267	0.3983	0.747	0.1681	0.044

Notes: *t*-Ratios in parenthesis, *p*-values in brackets. *Instruments*: Static IV estimation: lagged values ($t-1$ up to $t-3$) of the health spending variables; dynamic IV estimation: lagged values ($t-2$ and $t-3$) of the health spending variables, Gini index. *Tests*: The Sargan test the validity of instruments; high *p*-values fail to reject the null hypothesis, and hence there is no evidence to reject their validity. m_1 and m_2 test, respectively for first and second-order serial correlation in the error term.

* Indicates significance of estimated parameters at 10% level.
** Indicates significance of estimated parameters at 5% level.
*** Indicates significance of estimated parameters 1% level.

[17] Tables are available upon request from the authors.

Table 7
Health (public and private) spending. Sources of growth of output, expressed as percentages.

	Capital	Labour	HE^{tot}	HE^{pu}	HE^{pr}	TFP
All countries						
Model (I)	47.09	6.02	16.44	–	–	30.42
Model (II)	47.65	5.83	–	12.89	2.20	31.41
Model (III)	47.77	5.80	–	10.75	–	35.66
Model (IV)	49.36	5.96	–	–	2.08	42.58
Model (I) for countries						
Australia	41.94	7.56	13.53	–	–	36.93
Austria	46.50	7.08	17.67	–	–	28.73
Canada	77.78	8.84	17.23	–	–	−3.86
Denmark	13.55	4.15	19.37	–	–	60.91
Finland	22.14	1.31	15.43	–	–	61.11
Germany	45.90	12.69	19.15	–	–	22.25
Ireland	58.96	4.29	10.95	–	–	25.78
Italy	33.58	1.73	15.18	–	–	49.49
Japan	61.92	4.87	15.80	–	–	17.39
Luxembourg	45.89	5.91	10.79	–	–	37.39
Netherlands	31.59	12.07	17.82	–	–	38.50
New Zealand	32.23	14.07	22.02	–	–	31.65
Norway	38.65	4.64	16.59	–	–	40.11
Portugal	75.08	4.10	20.88	–	–	−0.08
Spain	40.31	6.28	22.39	–	–	31.00
Sweden	26.13	1.44	16.84	–	–	55.58
UK	42.59	2.89	19.51	–	–	34.98
US	73.18	7.10	17.14	–	–	2.56

for first and second-order serial correlation in the error term, respectively. As expected, m_1 is statistically significant, while m_2 is not, thus confirming the validity of instruments. We also test whether there is any dynamic structure in our model, by introducing lagged values of the GDP growth rate and the spending variables as regressors.[18] Our main results are substantially unchanged with respect to previous estimates in Table 2, even though, as the finite sample properties of most dynamic panel estimators are not well understood, one should be cautious (e.g., Temple, 1999). The magnitude of the coefficients associated to labour and health spending increases, with coefficients for HE^{tot} being now close to 0.10. Also in this case, the productivity of public expenditures on economic growth appears larger than that of private expenditures. The same type of results holds true in the dynamic version of our model. Indeed, the coefficients associated to contemporaneous HE^{pu} and HE^{pr} sum approximately to the coefficient associated to HE^{tot}, with the former greater than the latter. On the contrary, the coefficient for lagged health expenditure is significant (and negative) only when considering total expenditure, but becomes largely insignificant when splitting total spending in its components. Given the relevance of the differential impact of public and private spending, this last result seems to suggest that only *current* consumption of health services matters for economic growth.

3.5. An exercise in the arithmetic of growth

Starting from results discussed in the previous Section, a straightforward exercise that can be carried out in this framework is to decompose the GDP average growth rate at its sources. This exercise also allow us to compare our findings with those obtained by Herbertsson (2003), from which we borrow the accounting methodology. We limit ourselves to the estimates reported in Tables 2 and 3. Results of these exercises are shown in Tables 7 and 8, and are substantially in agreement with findings by Herbertsson. To begin with, considering all countries, in both cases half of the reported GDP growth rate is explained by growth in the stock of

[18] Notice that to instrument lagged regressors at time $t-1$, we use only lagged values in $t-2$ and $t-3$ of the same variable and the Gini coefficient.

Table 8
Health (public and private) and public education spending. Sources of growth of output, expressed as percentages.

All countries	Capital	Labour	HE^{tot}	HE^{pub}	HE^{pr}	E^{pub}	TFP
Model (I)	51.18	3.06	24.22	–	–	–	21.52
Model (II)	51.90	2.06	–	17.01	0.63	–	28.38
Model (III)	48.49	3.20	27.30	–	–	3.39	17.59
Model (IV)	48.47	2.23	–	22.18	–	3.33	23.50
Model (V)	49.51	1.87	–	19.51	–	3.31	25.77

Note: In model (IV), the point estimate for private spending in health has been considered as 0 given that is not significant in the estimation.

physical capital. The role of spending on health is significantly higher than that on education, with the former accounting for about 16–27% of economic growth, and with much of this result coming from the contribution given by public expenditures. The share of GDP growth accounted for by education expenditures is around 3%, a contribution similar to that by labour once we account for the role of the "human factor". The TFP component related to pure technological change contributes about 17–42%. These results need to be critically evaluated. First, as already mentioned in the paper, the contribution to GDP growth given by education expenditures is likely to be underestimated, for the empirical strategy considers only current expenditures. Second, we observe huge (and surprising) differentials across countries, especially for the TFP contribution, ranging from −3.86% for Canada to 61.11% for Finland. Even in the presence of a strong consensus for estimated magnitudes, these differentials are clearly difficult to explain, and presumably hints at the problem of parameter heterogeneity. However, the main message remains unchanged: public welfare expenditures contribute more than private expenditures to economic growth.

4. Concluding remarks

In this paper, we provide an initial attempt to explore issues that should be placed at the core of the ongoing academic and political debate concerning the Welfare State. Starting from a theoretical standpoint, we have emphasised the role that expenditures in health and education (two traditional welfare policies) play in enhancing the distribution and the (aggregate) level of the "human factor", which positively affects economic growth via either labour productivity or technical progress. We then address the following questions: is there any difference between public and private expenditures in health and education? Is there any evidence that countries which devote a larger amount of resources to the consumption of health and educational services experience higher growth rates? Our empirical analysis, based on a panel of 19 OECD countries observed from 1971 to 1998, shows a robust positive correlation between expenditures on health and education and GDP growth. The estimated positive impact is stronger for health than for education. More importantly, we find some evidence that public expenditures influence GDP growth more than private expenditures. In particular, our estimates suggest that a 1% increase in total health expenditure growth rate would increase the per-capita GDP growth rate by about 0.06–0.10%, with most of this effect coming from public expenditure (0.04–0.07%); the increase in GDP growth stemming from growth in (public) expenditure on education is around 0.03%. All these results appear to be robust after controlling for short-term business cycles fluctuations, the institutional settings, the potential endogeneity of welfare expenditures, and reverse causality. While their robustness could be further improved, we believe that our findings support the view that reform proposals aimed at downsizing welfare policies – that will result in an increase of the role of private markets in the allocation of health and educational services – should be discussed taking into account this first evidence that public expenditure on health and education do contribute to economic growth more than what private expenditure could be expected to do.

Acknowledgements

We wish to thank two anonymous referees, L. Becchetti, R. Cagliozzi, E. Fornero, A. de la Fuente, M. Grillo, C. Ornaghi, F. Revelli, D. Sonedda and all seminar participants at the 60th Congress of the International Institute of Public Finance (Bocconi University, Italy), the XV Conferenza Annuale SIEP (University of Pavia, Italy), the VII Encuentro de Economía Aplicada (University of Vigo, Spain), the 46ª Riunione Scientifica Annuale SIE (University of Naples, Italy) for comments on previous drafts of the paper.

Appendix A.

Descriptive statistics of the main variables used.

Name	Definition	Source	Mean	St. Dev.
$\Delta\ln Y_{it}$	Gross Domestic Product growth rate	PWT 6.1	0.02867	0.02573
$\Delta\ln K_{it}$	Private capital stock growth rate	PWT 6.1 and o.c.	0.01714	0.01518
$\Delta\ln L_{it}$	Employment growth rate	PWT 6.1	0.01242	0.02350
$\Delta\ln(HE^{tot})_{it}$	Total health spending growth rate	OECD Health Data	0.07731	0.04486
$\Delta\ln(HE^{pu})_{it}$	Public health spending growth rate	OECD Health Data	0.07664	0.04932
$\Delta\ln(HE^{pr})_{it}$	Private health spending growth rate	OECD Health Data	0.08126	0.06602
$\Delta\ln(E^{tot})_{it}$	Total education spending growth rate	WB and UNESCO	0.03399	0.05651
$\Delta\ln(E^{pu})_{it}$	Public education spending growth rate	WB and UNESCO	0.01522	0.11203
$\Delta\ln(E^{pr})_{it}$	Private education spending growth rate	WB and UNESCO	0.03967	0.69596
GINI	Gini index	Deininger and Squire (1996)	32.555	4.1081
EXECRLC	Dummy = 1 if government is left-wing	DPI2000	0.3941	–
MAJ	Fraction of seats held by government	DPI2000	0.5455	0.1001
LEGELEC	Dummy =1 if general election to be held in the year	DPI2000	0.3095	–
CGTAX	% of taxes collected by Central Govt	OECD Revenue Statistics	0.5950	0.1558

Notes: o.c.: own calculations. PWT 6.1: *Penn World Tables Mark 6.1*. WB: World Bank. Descriptive statistics for education spending are taken from World Bank data. DPI2000: Database of Political Institutions: Keefer (2002), The Development Research Group World Bank. See notes on tables presenting regression results with each of the variables presented for details on countries and data spans. Statistics for macroeconomic variables are for countries and data spans for regressions including health spending variables.

References

Aakvik, A., Salvanes, K.G., Vaage, K., 2005. Educational attainment and family background. German Economic Review 6 (3), 377–394.
Afonso A., Ebert W., Schuknecht, L., Thone, M., 2005. Quality of Public Finances and Growth. ECB Working Paper no. 438.
Aghion, P., Caroli, E., Garcia-Penalosa, C., 1999. Inequality and economic growth: the perspective of the new growth theories. Journal of Economic Literature XXXVII, 1615–1660.
Alesina, A., Rodrik, D., 1994. Distributive politics and economic growth. Quarterly Journal of Economics 109 (2), 465–490.
Anand, S., Ravallion, M., 1993. Human development in poor countries: on the role of private incomes and public services. Journal of Economic Perspectives 7 (1), 133–150.
Arellano, M., Bond, S., 1991. Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations. Review of Economic Studies 58, 277–297.
Atkinson, A.B., 1995a. The Welfare State and economic performance. National Tax Journal 48 (2), 171–198.
Atkinson, A.B., 1995b. Is the Welfare State necessarily an obstacle to economic growth? European Economic Review 39, 723–730.
Atkinson, A.B., 1999. The Economic Consequences of Rolling Back the Welfare State. MIT Press, Cambridge (MA).
Baldini, M., Turati, G., 2006. Long-run and short-run constraints in the access to private health care services: evidence from selected European countries. Materiali di discussione no. 543. Dipartimento di Economia Politica, Università di Modena e Reggio Emilia.
Barr, N., 1992. Economic theory and the Welfare State: a survey and interpretation. Journal of Economic Literature XXX (2), 741–803.
Barro, R., 1990. Government spending in a simple model of exogenous growth. Journal of Political Economy 98 (5), S103–S125.
Barro, R., 1999. Notes on growth accounting. Journal of Economic Growth 4 (2), 119–137.
Barro, R., Sala-I-Martin, X., 1995. Economic Growth. MIT Press, Cambridge (MA).
Beraldo, S., Montolio, D., Turati, G., 2005. Healthy, educated and wealthy: is the welfare state really harmful for growth? Working Paper no. 127. Universitat de Barcelona.
Besley, T., 2001. From micro to macro: public policies and aggregate economic performance. Fiscal Studies 22 (3), 357–374.
Bloom, D.E., Canning, D., Sevilla, J., 2004. The effect of health on economic growth: a production function approach. World Development 32 (1), 1–13.
Boucekkine, R., De La Croix, D., Licandro, O., 2002. Vintage human capital, demographic trends, and endogenous growth. Journal of Economic Theory 104, 340–375.
Carneiro, P., Heckman, J., 2003. Human capital policy. In: Heckman, J., Krueger, A.B. (Eds.), Inequality in America: What Role for Human Capital Policies? MIT Press, Cambridge, MA, pp. 77–239.
Chakraborty, S., 2004. Endogenous lifetime and economic growth. Journal of Economic Theory 116, 119–137.
Dearden, L., Mcgranahan, L., Sianesi, B., 2004. The Role of Credit Constraints in Educational Choices: Evidence from the NCDS and BCS70. Centre for the Economics of Education, LSE.
Deaton, A., 2003. Health, inequality, and economic development. Journal of Economic Literature XLI, 113–158.
Decker, S.L., Remler, D.K., 2004. How much might universal health insurance reduce socioeconomic disparities in health? A comparison of the US and Canada. Applied Health Economics and Health Policy 3 (4), 205–216.
Deininger, K., Squire, L., 1996. New data set measuring income inequality. World Bank Economic Review 10, 565–591.
Devarajan, S., Swaroop, V., Zou, H., 1996. The composition of public expenditure and economic growth. Journal of Monetary Economics 37, 313–344.
Durlauf, S.N., 2002. On the empirics of social capital. The Economic Journal 112, 459–479.
Easterly, W., Rebelo, S., 1994. Fiscal policy and economic growth: an empirical investigation. Journal of Monetary Economics 32, 417–458.
Gintis, H., Bowles, S., 1982. The Welfare State and long-term economic growth: Marxian, neoclassical, and Keynesian approaches. American Economic Review Papers and Proceedings 72 (2), 341–345.
Goodspeed, T.J., 2000. Education Spending, Inequality and Economic Growth: Evidence from US States. Mimeo, Hunter College, CUNY.
Gradstein, M., Justman, M., 2000. Human capital, social capital, and public schooling. European Economic Review 44, 879–890.
Grossman, M., 1972. On the concept of health capital and the demand for health. Journal of Political Economy 80 (2), 223–255.
Gupta, S., Verhoeven, M., Erwin, R.T., 2002. The effectiveness of government spending on education and health care in developing and transition economies. European Journal of Political Economy 18, 717–737.
Hanushek, E.A., 1996. Measuring investment in education. Journal of Economic Perspectives 10 (4), 9–30.
Hassler, J., Rodríguez-Mora, J.V., Storesletten, K., Zilibotti, F., 2003. The survival of the Welfare State. American Economic Review 93 (1), 87–112.
Hausman, J.A., 1978. Specification test in econometrics. Econometrica 46, 1251–1271.
Herbertsson, T.T., 2003. Accounting for human capital externalities with an application to the Nordic countries. European Economic Review 47, 553–567.
Herce, J.A., Sosvilla-Rivero, S., De Lucio, J.J., 2001. Growth and the Welfare States in the EU: a causality analysis. Public Choice 109, 55–68.
Hoff, K., Lyon, A.B., 1995. Non-leaky buckets: optimal redistributive taxation and agency costs. Journal of Public Economics 58 (3), 365–390.
Jappelli, T., Pistaferri, L., Weber, G., 2007. Health care quality and economic inequality. Health Economics 16 (4), 327–346.
Keefer, P., 2002. Database of Political Institutions: Changes and Variables Definitions. World Bank Development Research Group, Washington (DC).
Knack, S., Keefer, P., 1997. Does social capital have an economic payoff? A cross-country investigation. Quarterly Journal of Economics, 1251–1288.
Kneller, R., Bleaney, M.F., Gemmell, N., 1999. Fiscal policy and growth: evidence from OECD countries. Journal of Public Economics 74, 171–190.
Knowles, S., Owen, P.D., 1997. Education and health in an effective-labour empirical growth model. Economic Record 73 (223), 314–328.
Le, T., Gibson, J., Oxley, L., 2003. Cost- and income-based measures of human capital. Journal of Economic Surveys 17 (3), 271–307.
Lindbeck, A., 1997. The Swedish experiment. Journal of Economic Literature 35, 1273–1319.

Lindert, P.H., 2004. Growing Public: Social Spending and Economic Growth since the Eighteenth Century. Cambridge University Press.
Mankiw, N.G., Romer, D., Weil, D.N., 1992. A contribution to the empirics of economic growth. Quarterly Journal of Economics, 407–437.
Martin, J.P., Pearson, M., 2005. Should we extend the role of private social expenditure? IZA Discussion Papers 1544.
Perotti, R., 1992. Income distribution, politics, and growth. American Economic Review Papers and Proceedings 82 (2), 311–316.
Persson, T., Tabellini, G., 1994. Is inequality harmful for growth. American Economic Review 84 (3), 600–621.
Putterman, L., Romer, J.E., Silvestre, J., 1998. Does egalitarianism have a future? Journal of Economic Literature 36, 861–902.
Rajkumar, A.S., Swaroop, V., 2002. Public spending and outcomes: does governance matter? Working Paper No. 2840, The World Bank.
Sen, A., 1987. The Standard of Living. Cambridge University Press.
Sen, A., 2000. A decade of human development. Journal of Human Development 1 (1), 17–23.
Streeten, P., 1994. Human development: means and ends. The American Economic Review Papers and Proceedings 84 (2), 232–237.
Tabellini, G., 2005. The role of the state in economic development. Kyklos 58 (2), 283–303.
Temple, J., 1999. The new growth evidence. Journal of Economic Literature XXXVII, 112–156.
UNDP, 1990. Human Development Report. Oxford University Press, New York.
Webber, D.J., 2002. Policies to stimulate growth: should we invest in health or education? Applied Economics 34, 1633–1643.
Wößmann, L., 2003. Specifying human capital. Journal of Economic Surveys 17 (3), 239–270.
Zagler, M., Dürnecker, G., 2003. Fiscal policy and economic growth. Journal of Economic Surveys 17 (3), 397–418.